A Coming Water Crisis in Southern California?

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Abstract: Southern Californians are about to face some tough water choices. With the implementation of the Quantification Settlement Agreement (also called the "4.4 Plan"), California will within the next fifteen years be limited to its firmly allocated 4.4 million acre-feet per year of imported water from the Colorado River. This represents a reduction of 0.8 million acre-feet annually as other states claim their previously "unused" allocations. Making up for this loss will not be easy, even with continued conservation measures. Water transfers—redistributing water from Southern California's desert agricultural districts to urban coastal districts—have received the most attention, and both the Los Angeles-based Metropolitan Water District and the San Diego County Water Authority have entered into transfer agreements with the Imperial Irrigation District. But there are major hurdles to be overcome, including environmental impacts to the Salton Sea and opposition to "fallowing" by farmers who fear adverse effects on their regional economy if they are paid to leave fields idle so that water can be transferred to needy urban districts.

Introduction

Southern California's geography is both a blessing and a curse. Its pleasant climate and rich soils have attracted millions of residents over the years, yet most of the region is semiarid or arid, with limited endogenous water sources. Early in the twentieth century, it became clear that local water supplies would be insufficient to meet the needs of the burgeoning population. Outside sources would be needed, and the Colorado River was an obvious and early candidate.

The importation of Colorado River water to Southern Californian was authorized in the 1920s by the Colorado River Compact and apportioned among the seven states through which the river or its tributaries flow (National Academy of Sciences

1968). These agreements allocate 4.4 million acre-feet (maf) of Colorado River water annually to California (referred to as its "firm allocation"). However, because Southern California needed more water and other states were not using their full allocations, California was allowed to import some of this unused water, and in recent years has been taking up to 5.2 maf.

By the year 2000, however, other states were using most or all of their allocations and insisted that California's use of the "extra" water must end. Through a legal document called the Quantification Settlement Agreement, California will, after fifteen years, be allowed to import no more than its firm 4.4 maf allocation. This would mean a loss of up to 0.8 maf of water annually, which at present is viewed as indispensable to the Southern California economy.

Some of this loss can be recovered by water conservation measures. But most of the "easy" conservation measures were instituted in response to the 1987–91 drought. Partly as a result—and perhaps surprisingly—Southern California has some of the lowest per capita water use figures in the state. To make up both the 0.8 maf loss and meet expected growth needs via conservation alone would require draconian measures that would probably be politically infeasible.

Where will a replacement supply of up to 0.8 maf of fresh water be found? The most likely answer involves a combination of new sources (such as from desalinization) and redistribution of existing allocations, combined with a continued emphasis on conservation. Redistribution is receiving the most attention at present. Both the San Diego County Water Authority and the Los Angeles-based Metropolitan Water District have signed agreements with the Imperial Irrigation District to transfer conserved water from inland Imperial County to coastal Southern California. These agreements will be examined in more detail later in this article.

A more emotional question has been posed recently: if Colorado River water is to be redistributed within Southern California to serve the coastal economies, will agricultural counties such as Imperial suffer economically? There are also key environmental considerations concerning the Salton Sea in Imperial and Riverside counties. Perhaps the most interesting question is whether

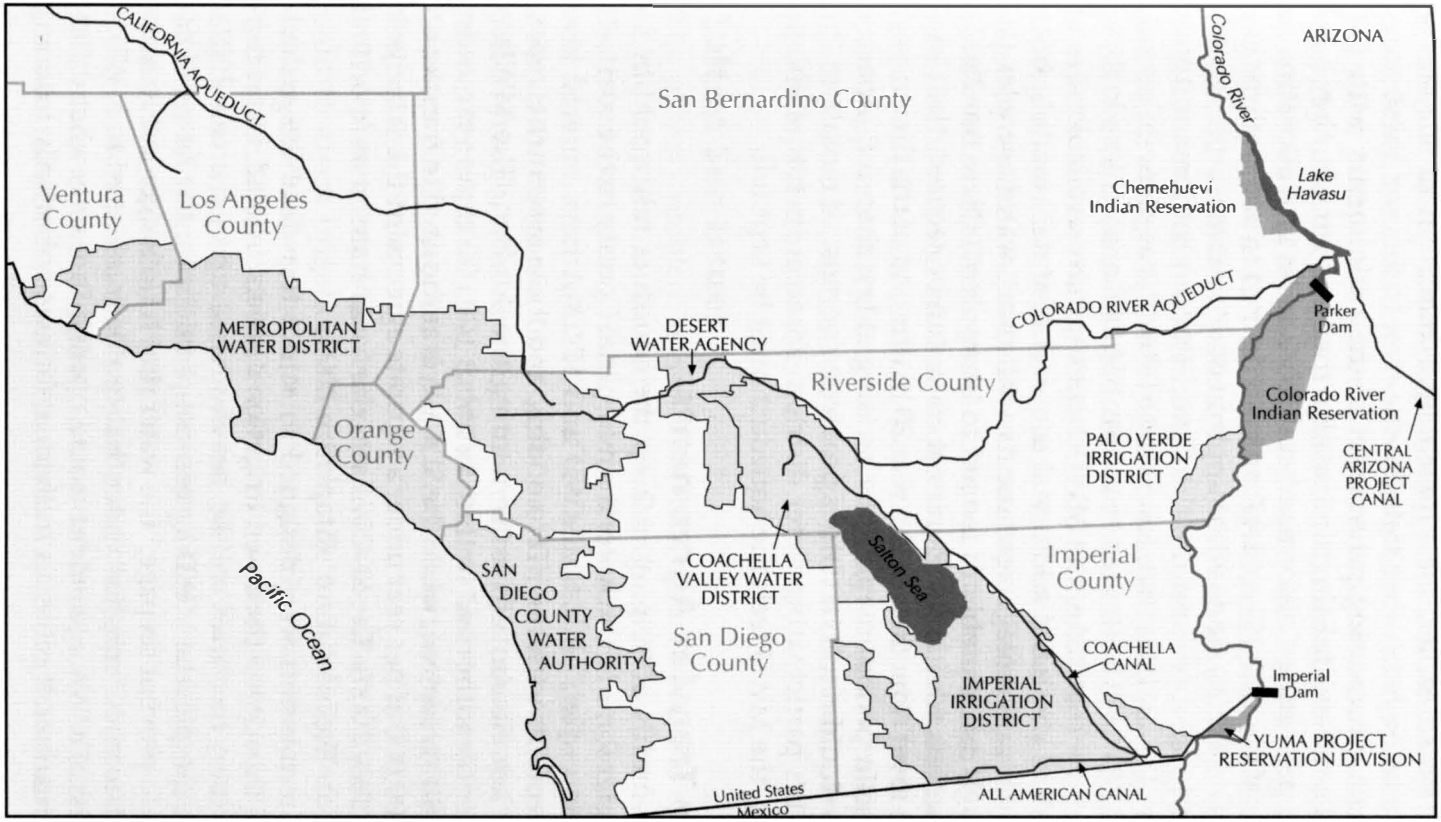

Figure 1.—Primary water agencies and transfer facilities in Southern California. Cartography by Kristen O'Grady.

As noted earlier, the supplemental allocation of 662,000 af really belongs to other states in the river basin, and these states are using increasing percentages of their allotments, with Arizona and Nevada using almost all of theirs. As a result, they have been pressuring California to scale back to its firm allocation of 4.4 maf annually. The "4.4 Plan" was devised to accomplish this.

The 4.4 Plan, along with supplemental "interim surplus guidelines," together comprise the Quantification Settlement Agreement. It mandates that, following a fifteen-year phase-in period, the MWD will be limited to its firm 550,000 af of Colorado River water. By that time, the MWD hopes to have available several hundred thousand additional acre-feet of water resulting from transfer and storage agreements with other water agencies (although many problems remain to be resolved) (Newcom 2002). But unless additional sources of water can be secured, the Colorado River Aqueduct in the year 2016 (the end of the fifteen-year phase-in period) may still be running at less than full capacity. This would result in serious problems for most, if not all, of the MWD's participating water districts. To meet its future obligations, the MWD feels the aqueduct must be kept full.

The Transfer Agreements

One means of helping to keep the aqueduct full would be to transfer some of the water from Imperial County to the coast. As noted earlier, both the MWD and SDCWA have entered into agreements with the IID to do this, and these agreements represent key elements in implementing the 4.4 Plan. The MWD is currently authorized to transfer about 100,000 af per year under a 1998 agreement, while the SDCWA is authorized to transfer up to 200,000 af per year under a separate agreement the same year (SDCWA 2000). The SDCWA sees the water transfer as "essential for San Diego's future" (Stapleton 2002).

The transfers were designed so as not to reduce the agricultural capacity of the desert irrigation districts; instead, water conservation measures will be heavily relied upon (Purcell 2001). For example, the MWD agreement provides for the lining of canals to prevent seepage;[1] the water that is no longer lost to seepage becomes "surplus" water that can be transferred to MWD.

The SDCWA agreement would operate in a somewhat different manner. It relies on individual farmers voluntarily reducing

their water use by improving on-farm practices, such as leveling their fields more accurately, installing drip irrigation, or utilizing water pump-back systems. Such techniques would conserve water by reducing amounts applied to the fields, or the volume of runoff leaving them. Additional water can be saved by making improvements to the IID canal system, which is aging and often utilizes outdated water control technologies (Purcell 2001). The IID could recover the cost of improvements through the amount it charges SDCWA for the conserved water.

All water conserved by these means would be available for transfer to urban and agricultural users in the MWD service area. Once the 4.4 Plan begins to phase in, there would be available capacity in the Colorado River Aqueduct (CRA) to transfer the conserved water. After years of heated discussions, in 1998 an agreement was signed that allows the SDCWA to transport its conserved IID water through the CRA at a reasonable price. This would appear at first glance to be a winning scenario for all stakeholders. But, as might easily be expected in the realm of water resources, there are problems.

Salton Sea Issues

The primary problem is environmental, concerning the effects of the transfers on the Salton Sea (McClurg 2001). The Salton Sea has a fascinating history, with the entire Salton Trough at one time connecting to the Gulf of California. In the postglacial period, the Colorado River has often flowed westward into the Salton Trough, creating a huge intermittent historical water body now referred to as Lake Cahuilla (Salton Sea Authority 2001; Showley 2002). At other times, it would flow southward into the Gulf of California.

The present sea was created in 1905–06, when a dike being built to divert irrigation water from the Colorado River broke, once again flooding the Salton Trough (DeBuys and Myers 1999). Today, the Salton Sea has evolved to become perhaps the most important interior water body on the Pacific Flyway, hosting millions of migratory and wintering birds annually (Shuford, Warnock, and Molina 1999).

Agriculture in the arid Imperial and Coachella valleys requires that excess water be applied to farmers' fields so as to flush out harmful salts from the soil. This excess water is deposited through

groundwater transport into the Salton Sea. In addition, unused water flowing through the many distribution canals ends up in the Sea. These two water sources are essential to maintaining the surface level of the Sea; indeed, the Sea continues to exist only because of this continuing input from the farms, which offsets about six feet of annual evaporation.

Because the Salton Sea is an interior water body, its salinity has been rising steadily (since the early twentieth century) and today exceeds that of ocean water—about 45,000 parts per million of salts, as compared to ocean water's 36,000. Every year, about 4.5 million tons of salts contained in the runoff water enter the Sea. At some point soon, the salinity will be sufficiently high to threaten the viability of fish life, which would eliminate not only an avian food supply but also an important subsistence fishery for local residents. The water transfers will speed up this process.

The U.S. Bureau of Reclamation has been the lead agency in searching for solutions to the salinity problems, issuing numerous reports during the 1990s (Cohen, Morrison, and Glenn 1999). In 1998, the Bureau proposed a menu of possible technical solutions but left many questions unanswered (Bureau of Reclamation 1998; LaRue 1998). The Bureau's recommended mitigation has always involved variants of desalinization systems, usually employing large diked-off ponds to permit evaporation of some of the Sea's water. But all variants of desalinization ponds produce huge quantities of salt that will need to be either stabilized or transported somewhere for disposal. Environmental effects were examined in depth in an environmental impact report in 2000, but again most reviewers felt that serious questions remained (Tetra Tech 2000).

The ongoing problem of increasing salinity exists independently of the proposed transfers. Similarly, another independent and ongoing problem is periodic massive die-offs of both fish and aquatic birds (Niiler 1998; Marcum 1999). High salinity is not the primary cause of these die-offs, although it may be a stress factor. The fish (mainly tilapia) tend to die off in summer when high temperatures lower oxygen content in the Sea. The bird die-offs result from diseases such as avian cholera and avian botulism, the causes of which are still poorly understood. Eutrophication from agricultural fertilizers and other nutrients

may be a factor but probably is not the root cause. Pesticides and other chemicals (such as selenium) that enter the Sea via agricultural runoff are not concentrated highly enough in either fish or birds to explain the problem.

The Salton Sea's mercurial nature has always created hardships for those who live near it. This includes speculators who bought into the Salton City land boom of the 1960s (DeBuys and Myers 1999), various contemporary business interests, Native Americans who live on nearby reservations, and several ethnic populations who rely on the Sea for subsistence fishing (Showley 2002). These considerations are some of the reasons why the Bureau of Reclamation proposed stabilizing both the salinity and surface level long before the transfers were signed.

The proposed water transfers produce their own set of problems. There is general agreement that there will be a reduction in the quantity of flows to the Sea as a result of implementing water conservation measures associated with the proposed transfers. The precise amount of these flow reductions has not been calculated but it could be considerable. As less water makes its way to the Salton Sea, the surface level will drop by several feet, magnifying the ongoing problems of stabilizing the Sea's salinity and reducing fish and bird die-offs.

Other significant consequences of this drop in surface level will be a loss of easy access to the water by persons and businesses now situated near the shore, a complete loss of the shallow water habitat heavily used by migratory shorebirds and other animal life, and the potential for serious dust/salt storms. This last consequence is so important as to require further discussion.

As the seashore recedes, a serious consequence will be the large expanse of newly exposed barren lake bottom containing various salts, pesticides, and other undesirable chemicals. Unless some way can be found to stabilize these bottomlands, it is likely that frequent high winds in the valley could create destructive dust/salt storms. These would be similar to, and possibly even larger than, those that have plagued the area around the dried-up bed of Owens Lake further north. Today, the possibility of dust storms resulting from lowering the Sea's surface level is the single most serious environmental concern. If storms occur, they could entail significant economic losses to both agriculture and

tourism in the Valley and perhaps engender health problems as well. Therefore, mitigation of adverse effects to the Salton Sea cannot be ignored, despite recent efforts by some agencies to downplay their significance (MWD 2002).

These and other adverse impacts are discussed in a recent Draft Project Environmental Impact Report (DPEIR) on the proposed water transfers (MWD 2002). However, most environmental organizations and many scientists feel the DPEIR greatly underestimates the significance of these impacts ("Declaration..." 2002). At the start of 2002, the Bureau of Reclamation had not, by its own admission, produced a mitigation alternative that offered more benefits than problems (as noted by Bureau spokespersons at a conference on the Salton Sea in January). What is needed to mitigate the transfer impacts is some additional source of fresh (or even brackish) water inputs to the Sea to help prevent shoreline exposure and reduce salinity, but no one has yet offered a viable suggestion as to a likely source. It will certainly not come from the oversubscribed Colorado River.

There is also the cost factor. Future reductions in inflow to the Sea were anticipated by Congress in 1998 when it passed Public Law 105-372, the Salton Sea Reclamation Act, which mandates restoration of the Sea to healthier conditions regardless of the magnitude of future inflow losses. The Act, however, authorized only a fraction of the money needed to accomplish this goal.

The cost of mitigation for the water transfers has become a major concern. If the required mitigation is viewed as including the full cost of stabilizing both the salinity and shoreline of the Salton Sea, the price tag would probably exceed a billion dollars. IID and SDCWA are willing to pay their "fair share" (that is, what they feel they can afford) for mitigation costs, but this amount would probably be less than ten percent of the total bill. The State of California is currently in tough financial times and is unlikely to volunteer to subsidize the mitigation costs. Likewise, the U.S. Congress is a very uncertain fiscal partner due to looming budget deficits and the fact that the typical representative is probably little concerned about this issue.

It can readily be seen that if rehabilitating the Salton Sea includes having to find adequate funding to fully mitigate both existing problems and the effects of the water transfers, then both the Sea and the transfer programs could be in trouble. If

the transfers are jeopardized, MWD and SDCWA believe the success of the entire 4.4 Plan, and Southern California's economic future, are threatened. "One piece falls and the whole thing fails," explained Salton Sea specialist Robert Campbell of the SDCWA (Perry 2002).

Needless to say, the coastal water districts are determined to prevent such a scenario. One current strategy is to try to get the water transfers exempted from state and federal laws relating to endangered species, such as California's Fully Protected Species Act. This approach is strenuously opposed by environmental groups. The desert water districts, for their part, are not so committed to the transfers, for reasons that will be examined in the next section. Indeed, in the spring of 2002 both the IID and Coachella Valley Association of Governments passed resolutions opposing the transfers (Yniguez 2002).

Bringing up the Dreaded "F" Word

During the water transfer negotiations, the one option that the valley farming interests and their elected officials consistently opposed was "fallowing." Fallowing refers to the deliberate non-cultivation of arable land; that is, using less water by simply leaving fields idle.

Farmers feared fallowing would mean less agricultural activity of all types, which could result in significant negative effects on the economies of the Imperial and Coachella valleys. Less farming would mean less fertilizer sales, less crop spraying, fewer seeds bought, fewer field hands employed, and so on. Thus farmers and politicians in the Valley insisted that there could be no agreement regarding water transfers that involved fallowing (Velush 2002). "Fallowing is a dirty word in the Imperial Valley," remarked Dave Nuffer, a local historian (Perry 2001). The fallowing concept was so avoided, so unspoken, during transfer discussions that it became known as the "f" word.

The fear of potential adverse effects of fallowing, however, is not universally shared in the desert agricultural region. In the summer of 2001, an agreement was signed by a nearby water district that involved fallowing. The directors of the Palo Verde Irrigation District (along the Colorado River near the city of Blythe) entered into a thirty-five-year agreement under which the MWD would pay them to leave some of their irrigated land

in fallow. A cap was included, which stipulated that at most twenty-nine percent of the District's agricultural land could be idled. The unused water could then be purchased by MWD for subsequent transfer via the Colorado River Aqueduct to coastal water districts, and could amount to as much as 110,000 af a year (Perry 2001).

Why do Palo Verde farmers not fear the potential adverse effects of fallowing? The payments that the district would receive for selling the unused water ($550 per acre per year) would come to many millions of dollars annually, quite possibly exceeding the net income the farmers would have realized by growing crops. Further, many believe that farmers will spend most of these in-lieu payments locally, in the Blythe area, resulting in no net economic loss to the area's economy. "If we get money, it gets spent here," said Blythe farmer Dan Robinson (Perry 2001). There might be less fertilizer sold, but more people would eat in restaurants and shop in stores. The local chamber of commerce, though, remains concerned about the effects of fallowing on agriculture-support businesses.

A pilot fallowing project was carried out earlier (1992–93) in the Palo Verde Irrigation District to test the economic effects of such a program. More than twenty thousand acres were involved in the program, with payments of $1,240 per acre received by participating farmers. Investigators concluded that fallowing had no significant effect on the overall regional economy nor on income to non-farm-related businesses. On the other hand, most farm-related businesses providing farm services felt a significant decrease in revenues, although those businesses providing farm supplies felt only a minor decrease. And it is important to note that pest infestations to the lettuce crop were creating a significant decline in agricultural support activities at the same time. Overall, sixty-one percent of program payments in excess of fixed costs were spent within the local economy ("Regional economic impacts..." 1994).

The Palo Verde Irrigation District agreement will not directly affect the IID, but several chambers of commerce in the Imperial Valley remain skeptical and officially opposed to fallowing. However, to many people, fallowing represents the most direct, least complex method of making more of California's 4.4 maf allotment of river water available to urban users. It involves the fewest environmental impacts and may even become a source of

additional fresh water for the Salton Sea. Selling water also represents a guaranteed income every year to participating farmers, which agriculture unfortunately does not.

A small crack appeared in the wall of Imperial Valley opposition to fallowing in the summer of 2002. An IID official sent a letter to California Governor Davis agreeing to a limited, five-year temporary fallowing program, but only under several fairly stringent conditions, one of which was compensation for any adverse economic effects to the Valley's economy (Allen 2002). Less than a month later, two environmental groups and a local Indian band filed suit to block any water transfers until a plan to protect the Sea, including mitigation, had been adopted.

Summary and Conclusion

Under the existing water transfer agreements, the main adverse effects will be environmental impacts to the Salton Sea. While there will probably be negative impacts on farm-related businesses if fallowing becomes commonplace in the Valley, the impacts on the Sea might be lessened since a portion of the unused water could (in theory at least) be directed into the Sea. If the Palo Verde experiment is successful and results in limited fallowing in the Imperial and Coachella Valleys—and compensation is provided—the long-term economic impacts in the region might be relatively small.

The MWD remains adamant that by the time the 4.4 Plan comes fully into play at the end of 2002, the water transfer agreements, along with other means of keeping the Colorado River Aqueduct full, must be in place and operating. Imperial Valley interests insist that for the transfers to happen there must be no resultant deterioration of the Valley's economy. Environmental groups insist the transfers must not result in accelerated deterioration of the Salton Sea. Conserving water by fallowing might be a start toward a viable solution if the above conditions can be met.

But these are all huge hurdles to be overcome, involving significant technical problems, environmental considerations, and economic and financial challenges. If adequate sources of funding to mitigate environmental impacts to the Sea cannot be secured, the water transfer agreements themselves could be in jeopardy. Barring an unlikely waiver or delay of the mandates of the

4.4 Plan, the flow in the aqueduct could be significantly reduced, with enormous implications for water usage and economic activity throughout Southern California.

There are other water supply options: large-scale wastewater reclamation and desalinization of ocean water, for example. But energy and cost implications make these alternatives at present too unattractive, and the timing provisions of the 4.4 Plan do not permit delays. As water agencies and elected officials already know, the next few years will be decisive ones for Southern Californians.

Note

1. An interesting problem arises from the canal lining process. One of the main canals to be lined, the All-American Canal, runs for a portion of its length very close to the U.S.-Mexico border. Some of the water that percolates out of it flows underground into Mexico and is currently being pumped for use in the Mexicali Valley. Lining the canal would eliminate this source of water on the Mexican side of the border. Mexicans view this groundwater as "their" water, but the U.S. State Department disagrees. Litigation is possible.

Postscript

As this journal was going to press, an accord was reached (October 16) that will allow implementation of the transfer agreement between the IID and SDCWA. In exchange for monetary assistance of $20 million to ameliorate the cost of displaced workers and other adverse economic consequences, the IID agreed to a limited fallowing program for fifteen years, with enough unused water to guarantee that present levels of flows from the Valley into the Salton Sea will continue. After fifteen years, a new accord will need to be constructed. The SDCWA will purchase 200,000 af of water annually at an initial price of $258 per acre-foot. (Source: Michael Gardner. "County strikes deal on water," San Diego Union-Tribune, 17 October 2002, A1.)"

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